Rise 'n' Shine Convent School - Dhamdha

PREBOARD EXAMINATION - 2020

Class – XII

Subject - Mathematics

Roll No: Date:- 06/01/2020 Time:-3 hrs Max. Marks : 80

General Instructions :-

1. All questions are compulsory.
2. The question paper consists of 36 questions divided into four Sections A ,B,C and D **Section-A** comprises of 20 questions of one mark each, **Section - B** comprises of 6 questions of 2 marks each, **Section – C** comprises of 6 questions of 4 marks each and **Section – D** comprises of 4 questions of 6 marks each
3. Use of calculator is not permitted.

SECTION - A

(Q1 - Q10 are multiple choice type questions. Select the correct option)

Q.1 If $y = \log(xe^x)$ then $\frac{dy}{dx}$ is (1 M)

(A) $\frac{x+1}{x}$ (B) $\frac{x+1}{xe^x}$ (C) $\frac{x-1}{xe^x}$ (D) $\frac{1}{xe^x}$

Q.2 Let R be a relation on set N defined by $x + 4y = 12$. The domain of R is (1 M)

(A){2,4,8} (B) {2,4,6,8} (C) {2,4,6,} (D) {4,8}

Q.3 If the function from $f: R \to R$ be defined by $f(x) = \frac{x}{2x-3}$ then $f^{-1}(2)$ is (1 M)

(A) $\frac{2}{3}$ (B) $\frac{3}{2}$ (C) 2 (D) -2

Q.4 If $2\cos^{-1} x = \cos^{-1}(2x^2 - 1)$ then value of x (1 M)

(A) $[-1, 1]$ (B) $(0, 1)$ (C) $[0, 1]$ (D) $\left[-\frac{1}{2}, \frac{1}{2}\right]$

Q.5 If the following function is continuous at $x = 1$ (1 M)

$$f(x) = \begin{cases} \frac{x^2+x-2}{x-1}, & if\ x \neq 1 \\ K, & if\ x = 1 \end{cases}$$ then the value of K is

(A) 2 (B) -2 (C) 3 (D) 0

Q.6 For what value of k, $\begin{bmatrix} 2k+3 & 4 & 5 \\ -4 & 0 & -6 \\ -5 & 6 & -2k-3 \end{bmatrix}$ is skew symmetric. (1 M)

(A) 0 (B) $\frac{3}{2}$ (C) $\frac{-2}{3}$ (D) $\frac{-3}{2}$

Q.7 If $\begin{vmatrix} x & x \\ 1 & x \end{vmatrix} = \begin{vmatrix} 3 & 4 \\ 1 & 2 \end{vmatrix}$ then positive value of x is (1 M)

(A) 1 (B) 2 (C) 3 (D) 4

Q.8 Find the area of the region bounded by the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ in sq. units (1 M)

(A) 25π (B) 20π (C) $20\pi^2$ (D) $25\pi^2$

Q.9 If $|\vec{a}| = 4, |\vec{b}| = 3$ and $\vec{a}.\vec{b} = 6\sqrt{3}$,then the value of $|\vec{a} \times \vec{b}|$ (1 M)

(A) 2 (B) 4 (C) 6 (D) $18\sqrt{3}$

Q.10 An urn contain 5 red and 5 black balls. Two balls are drawn at random without replacement then the probability of getting one red and one black balls (1 M)

(A) $\frac{1}{2}$ (B) $\frac{5}{18}$ (C) $\frac{5}{9}$ (D) $\frac{1}{5}$

Q .No 11 to Q. No 15 fill in the blank

Q.11 If f be the greatest integer function defined as f(x) = [x] and g be the modulus function defined as g(x) = |x| , then the value of $gof\left(-\frac{5}{2}\right)$ is ..... (1 M)

Q.12 The drs of a line $\vec{r} = 2\hat{\imath} - 2\hat{\jmath} + 3\hat{k} + \lambda(\hat{\imath} + \hat{\jmath} - 2\hat{k})$ is ..... (1 M)

Q.13 If tangent to the curve $y^2 - 4x + 5 = 0$ at the point $(p, k)$is parallel to line $x - y = 6$ then the value of k is ..... (1 M)

Q.14 The degree of the differential equation $\left(\frac{d^2x}{dx^2}\right)^3 - \sqrt{\frac{dy}{dx}} + 1 = 0$ is ..... (1 M)

Q.15 The integrating factor of differential equation $\frac{dy}{dx} + \frac{y}{x} = e^x$ is ..... (1 M)

(Q16 - Q20) Direct answer the following questions

Q.16 Find the projection of vector $\hat{\imath} + 3\hat{\jmath} + 7\hat{k}$ on the vector $2\hat{\imath} - 3\hat{\jmath} + 6\hat{k}$ (1 M)

Q.17 Find the distance of a point $(2, 5, -3)$ from the plane $5x - 37 + 2z - 4 = 0$ (1 M)

Q.18 Evaluate $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} sin^3x \ dx$ (1 M)

Q.19 Evaluate $\frac{d}{dx} e^{\log_e x}$ (1 M)

Q.20 The sides of a square is increasing at rate of 0.5 cm/s . Find the rate of increases of the perimeter of the square. (1 M)

SECTION - B

Q.21 A problem in math's is given to three students A, B and C whose chance of solving it independently are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively .find the probability that the problem is solved . (2 M)

Q.22 Integrate $\int \frac{e^x + e^{-x}}{e^x - e^{-x}} dx.$ (2 M)

OR

Integrate $\int \frac{\cos x}{\sqrt{1+\sin x}} dx$

Q.23 If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \cdots \ldots \ldots \ldots \infty}}}$ then prove that $\frac{dy}{dx} = \frac{\cos x}{2y-1}$ (2 M)

Q.24 Find the intervals in which the function f(x) = 6 – $9x - x^2$ is strictly increasing or decreasing (2 M)

Q.25 If $\overrightarrow{a}$ and $\overrightarrow{b}$ are two unit vectors such that $\overrightarrow{a} + \overrightarrow{b}$ is also a unit vector then find the angle between $\overrightarrow{a}$ and $\overrightarrow{b}$. (2 M)

OR

Find the a vector of magnitude 6 which is perpendicular to both the vectors $2\hat{\imath} - \hat{\jmath} + 2\hat{k}$ and $24 - \hat{\jmath} + 3\hat{k}$

Q.26 Prove that $2\ \sin^{-1}\frac{3}{5} - \tan^{-1}\frac{17}{31} = \frac{\pi}{4}$ (2 M)

SECTION - C

Q.27 Differentiate $\sin^{-1}\left\{\frac{2^{x+1}3^x}{1+36^x}\right\}$ $w.r.t\ x$ (4 M)

Q.28 Show that the relation R in the set A = $\{1, 2, 3, 4, 5\}$ is given by R = $\{(a, b) : |a - b|$ is divisible by 2$\}$ is an equivalence relation (4 M)

Q.29 Find the particular solution of the differential equation $\frac{dy}{dx} + 2y\tan x = \sin x$, given that $y = 0\ when\ \ x = \frac{\pi}{3}$ (4 M)

OR

Find the general solution of the diff. equation $2xy\frac{dy}{dx} = x^2 + 3y^2$

Q.30 Evaluate $\int_0^{\frac{\pi}{2}} \frac{5\sin x + 3\cos x}{\sin x + \cos x}\, dx$ (4 M)

Q.31 Find the equation of plane passing through the line of intersection of planes $2x + y - z = 3$ and $5x - 3y + 4z + 9 = 0$ and is parallel to the line $\frac{x-1}{2} = \frac{y-3}{4} = \frac{5-z}{-5}$ (4 M)

Q.32 Bag I contains 3 red 4 black balls and Bag II contains 4 red and 5 black balls . one ball is transferred from Bag I to Bag II and then a ball is drawn from Bag II . The ball so drawn is found to be red . Find the probability that the transferred ball is black. (4 M)

OR

Two cards are drawn successively with replacement from a pack of 52 cards . Find the probability distribution of the number of face card.

SECTION - D

Q.33 (6 M)

If $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$ and $p \neq a, q \neq b, r \neq c$

then find the value of $\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c}$

OR

Solve the system of following equations by method of matrix

$2x - 3y + 3z = 5$, $3x + 2y - 4z = -5$, $x + y - 2z = -3$

Q.34 **OR** (6 M)

There are two factories located one at place P and other at Q .From these locations, a certain commodity is to be delivered to each of the three depots situated at A ,B and C .The weekly requirements of the depots are respectively 5 , 5 and 4 units of commodity while the production capacity of the factories at P and Q are respectively 8 and 6 units . The cost of transportation per unit is given below :

From/ To	Cost (in Rs)		
	A	B	C
P	160	100	150
Q	100	120	100

How many units should be transported from each factory to A cottage industry manufactures pedestal lamps and wooden shades, each requiring the use of a grinding/cutting machine and a sprayer. It takes 2 hours on the grinding/cutting machine and 3 hours on the sprayer to manufacture a pedestal lamp. It takes 1 hour on the grinding/cutting machine and 2 hours on the sprayer to manufacture a shade. On any day, the sprayer is available for at the most 20 hours and the grinding/cutting machine for at the most 12 hours. The profit from the sale of a lamp is Rs 25 and that from a shade is Rs15. Assuming that the manufacturer can sell all the lamps and shades that he produces, how should he schedule his daily production in order to maximize his profit. Formulate an LPP and solve it graphically.

each depot in order that the transportation cost is minimum. What will be minimum

transportation cost.

Q.35 Show that the semi vertical angle of right circular cone of given surface area and maximum volume is $\sin^{-1}\left(\frac{1}{3}\right)$ (6 M)

Q.36 Using Integration find area of the circle of circle $x^2 + y^2 = 16$ interior to the parabola $y^2 = 6x$ (6 M)